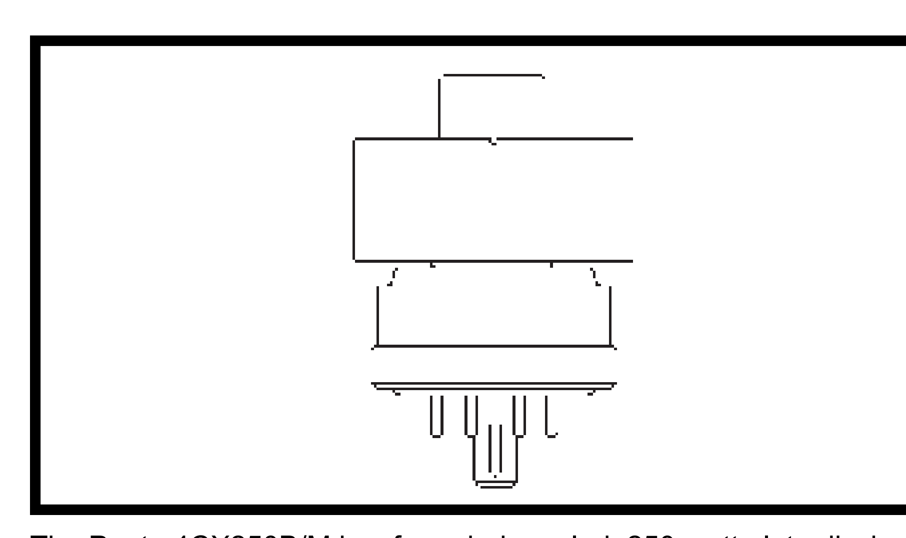


4CX250B/M
Radial-Beam Power Tetrode



The Penta 4CX250B/M is a forced-air cooled, 250-watt plate dissipation, external anode, ceramic and metal radial beam tetrode. The superior construction of the 4CX250B/M makes it ideal for use as a grid driven RF amplifier or oscillator, or an AF power amplifier or modulator.

ELECTRICAL CHARACTERISTICS

Characteristic	Value	Unit
Cathode - - Unipotential Oxide Coated		
Heater:		
Voltage	6.0 ±0.30	Volts
Current	2.6	Amperes
Maximum Cathode-Heater Potential	±150	Volts
Amplification Factor	5	
Interelectrode Capacitances - - Grounded Grid and Screen		
Feedback	0.01	pF
Input	13	pF
Output	4.5	pF
Interelectrode Capacitances - - Grounded Cathode		
Feedback	0.04	pF
Input	15.7	pF
Output	4.5	pF
Frequency of Maximum Rating	500	MHz

MECHANICAL CHARACTERISTICS

Characteristic	Value	Unit
Base	JEDEC B8-236	
Maximum Overall Dimensions		
Length	2.46	Inches
Diameter	1.65	Inches
Net Weight	4.0	Onces
Mounting Position	Any	
Maximum Seal and Anode Temperature	250°C	
Cooling	Forced Air	
Recommended Socket and Chimney	PL600/PL606	
Required Air Flow at Maximum Dissipation	6.5	CFM

(Revised 12/12/96)



P E N T A   L A B O R A T O R I E S
21113 SUPERIOR STREET * CHATSWORTH * CALIFORNIA 91311
(800) 421-4219 * (818) 882-3872 * FAX: (818) 882-3968

COOLING

Forced air cooling of the base, base seals, and other external tube surfaces is required for all classes of operation. The use of the PL600 socket and the PL606 chimney, in conjunction with a blower capable of sustaining the required air flow is highly recommended. It should be noted that maintaining surface temperatures below the maximum values will substantially prolong the useful life of the tube.

The air flow required to sustain the tube surface temperature at 200°C (at sea level and for operation where ambient air temperature does not exceed 50°C) is listed below.

Dissipation	Air Flow	Pressure Drop
200 Watts	5.0 CFM	0.52 In./H_2O
250 Watts	6.5 CFM	0.87 In./H_2O

It is necessary to keep in mind that high altitude operation, or operation where ambient air temperatures exceed 50°C will require addition air flow to maintain the desired tube surface temperature.

Useful life can be extended by maintaining the flow of cooling air to the tube during standby periods (i.e., those periods when only heater voltage is applied.) Care should be taken to insure that the anode surface and cooling fins remain free from any dirt or debris which might interfere with the effective cooling of the tube.

VIBRATION

The rugged construction of the 4CX250B/M makes it an ideal choice for use in environments where a moderate degree of shock and vibration are likely to be encountered. Such applications include truck and automobile mobile units and other similar classes of service. In those situations where extreme shock and vibration are anticipated, the ruggedized version of this tube, the Penta 4CX250R is highly recommended.

PLATE DISSIPATION

Under all classes of operation, the maximum plate dissipation allowable for the 4CX250B/M is 250 watts; however, in plate modulated applications, this maximum must be limited to 165 watts. During tuning, plate dissipation may be permitted to rise above the stated maximums for brief periods of time.

SCREEN-GRID OPERATION

Under no conditions should the screen dissipation be allowed to exceed 12 watts. In that excessive screen dissipation is likely to result where plate voltage, plate load, or bias voltage are removed, suitable precautions should be taken to avoid these conditions while filament and screen voltages are applied.

CONTROL GRID OPERATION

The 4CX250B/M has a maximum control grid dissipation rating of 2.0 watts and a maximum grid dissipation rating of -250 dc volts; failure to respect these maximums will result in damage to the tube. Tube life can be extended by maintaining grid bias and driving power within the recommended value ranges whenever possible. The maximum grid circuit resistance is 100,000 ohms per tube.

HEATER VOLTAGE

The 4CX250B/M is designed to operate with 6.0 volts applied to the heater. Under no circumstances should filament voltage be allowed to exceed this value by more than 5%. The useful life of the tube can be extended by adhering to this value as closely as possible.

At frequencies exceeding 300 MHz, cathode temperature begins to be influenced by transit time effects. Under such conditions, the exact amount of driving power which is diverted to heating the cathode is difficult to estimate and is affected by a variety of factors (frequency, driving power, plate current, etc.) When the tube is subjected to maximum input, 0.05 volts should be deducted from the heater voltage for every 20MHz by which the tube exceeds 300 MHz (at 400MHz, 400-300=100, 100/20=5, 5x0.05=.25, 6.0-.25=5.75, thus heater voltage should be limited to 5.75 volts.)

MULTIPLE AND VHF OPERATION

When a pair of 4CX250B/M tubes operated under parallel or push-pull conditions, it is imperative that the load be shared equally by both tubes. Overload protection should be designed in such a way so as to protect either tube in the event that a single tube should fail.

When the 4CX250B/M is operated in the VHF region, it may be desirable to achieve an increase in tube life at the expense of operating efficiency. Minimum bias, heavy plate loading, and as low degree of driving power as is practical should be employed.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

RF Power Amplifier or Oscillator--Class C Telegraphy

Maximum Ratings

DC Plate Voltage	DC	2000	Volts
Screen Voltage		300	Volts
DC Grid Voltage	DC	-250	Volts
Plate Current		0.25	Ampere
Plate Dissipation		250	Watts
Screen Dissipation		12.0	Watts
Grid Dissipation		2.0	Watts

Typical Operation

	Frequencies to 175 MHz				500MHz	
DC Plate Voltage	500	1000	1500	2000	2000	Volts
DC Screen Voltage	250	250	250	250	300	Volts
DC Grid Voltage	-90	-90	-90	-90	-90	Volts
DC Plate Current	250	250	250	250	250	mA
DC Screen Current	45	38	21	19	10	mA
DC Grid Current	35	31	28	26	10	mA
Peak RF Grid Voltage	114	114	112	112	- - -	Volts
Driving Power	4.0	3.5	3.2	2.9	- - -	Watts
Plate Input Power ... Plate	125	250	375	500	500	Watts
Output Power ... Heater	70	190	280	390	290	Watts
Voltage	6.0	6.0	6.0	6.0	5.5	Volts

Plate Modulated RF Power Amplifier--Class C Telephony (Amplifier-Grid Driven)

Maximum Ratings		1500	Volts
DC Plate Voltage	DC	300	Volts
Screen Voltage		-250	Volts
DC Grid Voltage	DC	0.20	Ampere
Plate Current		165	Watts
Plate Dissipation		12.0	Watts
Screen Dissipation		2.0	Watts
Grid Dissipation			

Typical Operation

DC Plate Voltage	500	1000	1500	Volts
DC Screen Voltage	250	250	250	Volts
DC Grid Voltage	-100	-100	-100	Volts
DC Plate Current	200	200	200	mA
DC Screen Current	31	22	20	mA
DC Grid Current	15	14	14	mA
Peak RF Grid Voltage	118	117	117	Volts
Driving Power	1.8	1.7	1.7	Watts
Plate Input Power ... Plate	100	200	300	Watts
Output Power	60	145	235	Watts



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AF Amplifier or Modulator--Class AB_1
Maximum Ratings (Per Tube)

DC Plate Voltage	2000	Volts
DC Screen Voltage	400	Volts
DC Grid Voltage	-250	Volts
DC Plate Current	0.25	Ampere
Plate Dissipation	250	Watts
Screen Dissipation	12.0	Watts
Grid Dissipation	2.0	Watts

Typical Operation (Two Tubes)

DC Plate Voltage	1000	1500	2000	Volts
DC Screen Voltage	350	350	350	Volts
DC Grid Voltage (1/3)	-55	-55	-55	Volts
Zero-Signal DC Plate Current	200	200	200	mA
Maximum Signal DC Plate Current	500	500	500	mA
Maximum Signal DC Screen Current	20	16	10	mA
Maximum Signal DC Grid Current	0	0	0	mA
Peak AF Grid Voltage	50	50	50	Volts
.	0	0	0	Watts
Peak Driving Power	500	750	1000	Watts
.	240	430	600	Watts
Plate Input Power	3500	6200	9500	Ω
. Plate Output Power				
Plate to Plate Load Resistance				

RF Linear Amplifier--Class AB_1 (SSB or Carrier Conditions)
Maximum Ratings

DC Plate Voltage	2000	Volts
. . DC Screen Voltage	400	Volts
. . .	-250	Volts
DC Grid Voltage	0.25	Ampere
. . DC Plate Current	250	Watts
. . . . .	12.0	Watts
Plate Dissipation	2.0	Watts
. .		
Screen Dissipation		

Typical Operation

DC Plate Voltage	1000	1500	2000	Volts
Grid Dissipation	350	350	350	Volts
DC Screen Voltage	-55	-55	-55	Volts
DC Grid Voltage	100	100	100	mA
.				
Zero-Signal DC Plate Current	250	250	250	mA
SSB	190	190	190	mA
Single Tone DC Plate Current	10	8	5	mA
Two-Tone DC Plate Current	2.0	-1.0	-2.0	mA
Single Tone DC Screen Current	0	0	0	mA
Two-Tone DC Screen Current	50	50	50	Volts
Single Tone DC Grid Current	120	215	300	Watts
Peak RF Grid Voltage	2000	3000	4000	Ω
Plate Output Power				
Resonant Load Impedance	150	150	150	mA
Carrier Conditions	-3	-4	-4	mA
Carrier DC Plate Current	25	25	25	Volts
Carrier DC Screen Current	30	50	65	Watts
Peak RF Grid Voltage				
. Plate Output Power				
. .				



4CX250B/M Power Tetrode

4CX250B/M
CONSTANT CURRENT
CHARACTERISTICS

4CX250B/M
CONSTANT CURRENT
CHARACTERISTICS

SCREEN VOLTAGE = 350V
PLATE CURRENT - AMPERES
SCREEN CURRENT - AMPERES
GRID CURRENT - AMPERES

GRID VOLTAGE (V)

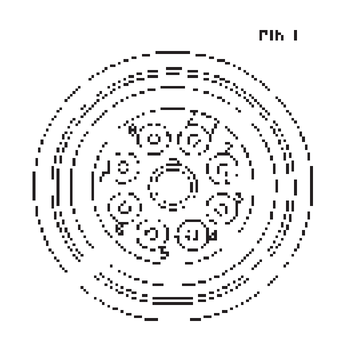


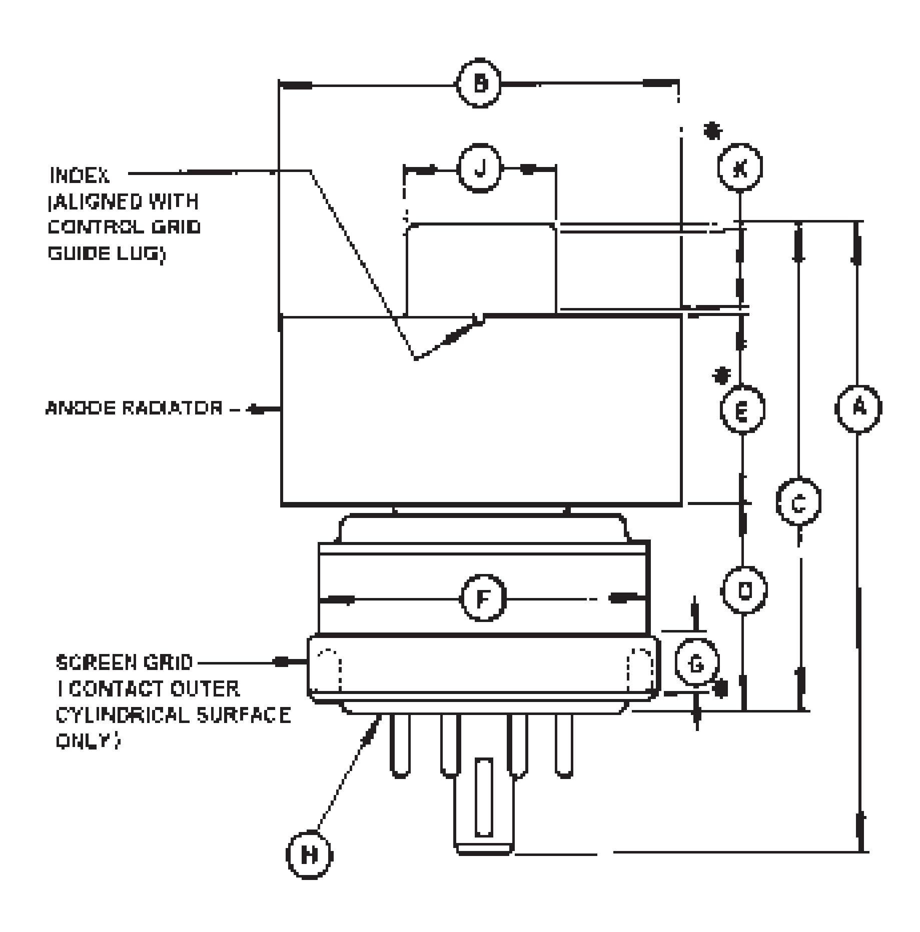
4CX250B/M Power Tetrode

PIN DESIGNATION

PIN NO. 1	SCREEN GRID
PIN NO. 2	CATHODE
PIN NO. 3	HEATER
PIN NO. 4	CATHODE
PIN NO. 5	I.C. DO NOT USE FOR EXTERNAL CONNECTION
PIN NO. 6	CATHODE
PIN NO. 7	HEATER
PIN NO. 8	CATHODE
CENTER PIN -	CONTROL GRID

DIMENSIONAL DATA				
DIM.	INCHES		MILLIMETERS	
	MIN	MAX.	MIN	MAX
A	2.342	2.464	59.03	62.59
B	1.610	1.640	40.89	41.66
C	1.810	1.910	45.97	48.51
D	0.750	0.810	19.05	20.57
E	0.710	0.790	18.03	20.07
F	--	1.406	--	35.71
G	0.187	--	4.75	--
H	BASE: B0-236 (JEDEC DESIGNATION)			
J	0.559	0.573	14.20	14.55
K	0.240	--	6.10	--





NOTES:
1. REF DIMS. ARE FOR INFO. ONLY AND ARE NOT REQD. FOR INSPECTION PURPOSES.
2. (*) CONTACT SURFACES.